REMARKS

Claims 1-26 are pending. New claim 26 is added and is at least supported by original claim 9. The claims have been amended, and are supported by the specification. No new matter is added.

Claims 1 and 9 are the independent claims.

I. The 112 issues at points 2 –17 of the Office Action.

The 112 issues have all been addressed per the Examiner's suggestions. These amendments are made to correct mere matters of form, and antecedent basis, and are therefore made for reasons only tangential to equivalents.

Point 18 of the Office Action

In regard to claim 23, the etalon is stationary during the tuning process in claim 23. The piezo actuator is used for changing the length of the resonator cavity.

Therefore, the 112 issues are respectfully traversed.

II. The anticipation rejections of independent claim 9 and dependent claim 10 in view of Estowitz et al., US 5,272,708, "Two-Micron Modelocked Laser System."

Claim 9 (and also claim 1) is amended for matters of form as discussed above, and also to include the language from page 11, line 5 of "to traverse the maximum possible tuning range in a continuous manner." Therefore, no new matter has been added.

Claim 9 (as amended herein) ***claims (emphasis added)***:

9. (Once Amended) An arrangement ***for the self-calibration*** of a tunable, diode pumped solid state laser, wherein the [laser] arrangement comprises:

a laser diode as a pump light source followed by in-coupling optics,

a laser crystal followed by out-coupling optics or a nonlinear, frequency-doubling crystal, wherein the outer surfaces of the laser crystal, the out-coupling optics [and] and frequency-doubling crystal [or out-coupling mirror] have a reflective coating for the laser fundamental frequency and/or for the frequency-doubled radiation and enclose [the] a cavity between them; [and

further comprises:]

an actuator for varying the cavity length for purposes of tuning ***and calibrating*** the laser ***to traverse a maximum possible tuning range in a continuous manner;***

an etalon being provided ***inside the cavity for changing*** [(expanding)] ***the tuning range and for determining the output power of the laser,*** wherein the etalon is rotatable or swivelable about an axis of rotation which extends at right angles to the optical axis of the laser or at an inclination to the latter by a small angle.

In contrast, Esterowitz concerns a laser with a Tm^{3+}-doped laser crystal. This arrangement ***is not used for calibrating the laser to traverse the maximum possible tuning range in a continuous manner***, but instead is provided for generating short pulses in combination with other units (such as a modulator). Therefore, the criteria by which the actuator and/or etalon is changed and tuned are completely different from claim 9. This is because Esterowitz has the object of building a laser for generating **the shortest possible laser pulses.** In a corresponding manner, the frequency-selective element is also used only for generating the shortest possible pulses. Therefore, Esterowitz has a completely different teaching than claim 9.

Therefore, it is respectfully asserted that as at least ***the emphasized*** limitations above are not taught by Estowitz et al., US 5,272,708, in an element-by-element fashion, claim 9 should be allowable.

Claim 10 depends from claim 9 and therefore it should also be allowable.

III. The obviousness rejections of claims 1-1 and 11-25 in view of the combination of the three references Esterowitz, '708 above and Esterowitz et al., US 4,969,150 and Terada et al., US 5,084,884.

Claims 1 and 9 claim self-calibration to a maximum possible tuning range. In contrast, both Esterowitz references only teach and suggest obtaining some defined wavelength within the amplification range.

Also in claims 1 and 9 an external device for wavelength determination is not used as in the references. Therefore, the solutions in Esterowitz have a completely different teaching and suggestion.

Terada also does not try to achieve a tuning range which is as large as possible. Instead, he uses external devices to minimize fluctuations in frequency and output.

During tuning, the present invention as claimed, uses the changes in the output of individual components to predict the frequency response and obtain the tuning characteristic of the individual components. With this information, ***it is possible to achieve a maximum and continuous tuning range***, as claimed, i.e., without mode jumps **(see also claim 8).**

On the other hand, the object of Terada is to achieve in a defined manner a determined frequency point within the amplification range; again, this is a completely different object.

Therefore, it is respectfully asserted that, as at least the ***emphasized limitations*** above are not taught or suggested by the references, there is no motivation to combine these references to teach the claim language of claims 1 and 9, and no reasonable expectation of success can be found from teachings which do not exist in the cited references. Therefore, it is respectfully asserted that none of the references taken alone or in combination, establishes a *prima facie* case of obviousness as required by MPEP 706.02(j) citing the statute and case law.

Thus, although the Examiner is respectfully believed to be well versed in the law of obviousness, and combination of references, the relevant law is reproduced below for completeness of the record.

In order to establish a *prima facie* case of obviousness under 35 USC 103 according

to section 706.02(j) of the Manual of Patent Examining Procedure (MPEP) the following criteria must be met:

The MPEP Standard for Combining/Modifying References

The Manual of Patent Examining Procedure, section 706.02(j) sets forth the standard for combining and/or modifying prior art, and states:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. **First**, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. **Second**, there must be a reasonable expectation of success. **Finally**, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 - § 2143.03 for decisions pertinent to each of these criteria. **[Bold emphasis provided.]**

IV. Conclusion.

In light of the *FESTO* case, no claim amendment or argument made herein was related to the statutory requirements of patentability unless expressly stated herein. No claim amendment or argument made was for the purpose of narrowing the scope of any claim unless Applicant has explicitly stated that the argument is "narrowing." Thus, the amendments herein were made for no more than a "tangential relation" for any equivalents unless explicitly stated that they were not a "tangential relation" reason for amendment or argument. Therefore, it is respectfully requested that all of the claims be reconsidered and allowed.

Please call the undersigned for any reason to expedite prosecution of this application.

Respectfully submitted,

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MARKED-UP CLAIMS

All of the claims whether amended or not, are provided below for the convenience of the Examiner.

PLEASE AMEND THE CLAIMS AS FOLLOWS:

1. (Once amended) A method for the self-calibration of a tunable, diode pumped solid state laser in which the frequency or the wavelength of the laser radiation of the fundamental frequency and/or doubled frequency is changed comprising [the step of]:

changing the optical cavity length by a piezo-actuator or Brewster window over the total amplification bandwidth of the laser-active material; [and

further including the steps of:]

recording and storing [the] performance curves during [the] a tuning of [an] at least one [etalon or corresponding] optical [elements] element arranged in the cavity to traverse a maximum possible tuning range in a continuous manner;

generating or deriving a tuning function for the [respective] at least one optical element [or optical elements] from these curves by a microcontroller or computer; and

adjusting an optimum working point for the at least one optical element [or optical elements] for maximum suppression of side modes by a digital or analog regulator with the help of a learning curve or learning characteristic.

2. (Once amended) The method according to claim 1, wherein the [etalon or an] optical element is tuned with increasing amplitude for recording the learning curve and there is a correction of the deviation from the optimal position at the edge of the tuning range of another optical element.

3. (Once amended) The method according to claim 1, wherein the adjustment of the [etalon] optical element is adapted to the change in length of the cavity.

4. (Once amended) The method according to claim 1, wherein for optimizing [an] the optical element, the optical element is itself modulated or another optical element is modulated.

5. (Once amended) The method according to claim 1, wherein by modulating the optical element, a tuning characteristic of the latter or of another optical element is generated, [(recorded)] recorded, and stored.

6. (Once amended) The method according to claim 1, wherein [the] frequency-selective elements of the laser are adjusted between two mode jumps by the microcontroller or computer according to the recorded laser characteristic in such a way that side modes are suppressed to a maximum degree.

7. (Once amended) The method according to claim 1[,]:

wherein the at least one optical element is an etalon; and

wherein the performance curve of the laser is recorded with a change of the rotational angle δ of the etalon and while maintaining a constant cavity length, and also with a change in the cavity length [and a stationary] while keeping the etalon stationary.

8. (Once amended) The method according to claim 1, wherein the learning characteristic is adjusted in that the cavity length [(the "finest"] and the finest frequency-selective element of the laser [laser)] determining the frequency is tuned with increasing amplitude, in that the mode jumps occurring at the edge of the tuning range are detected and/or registered by a suitable measuring instrument or via the output of the laser,

wherein the movement of the next coarsest frequency-selective element at the edge of the tuning range is then changed until a frequency jump [(in] in the characteristic [characteristic)] no longer occurs, and wherein the entire position movement [(movement)] of the coarser element is then stored.

9. (Once Amended) An arrangement for the self-calibration of a tunable, diode pumped solid state laser, wherein the [laser] arrangement comprises:

a laser diode as a pump light source followed by in-coupling optics,

a laser crystal followed by out-coupling optics or a nonlinear, frequency-doubling crystal, wherein the outer surfaces of the laser crystal, the out-coupling optics [and] and frequency-doubling crystal [or out-coupling mirror] have a reflective coating for the laser fundamental frequency and/or for the frequency-doubled radiation and enclose [the] a cavity between them; [and

further comprises:]

an actuator for varying the cavity length for purposes of tuning and calibrating the laser to traverse a maximum possible tuning range in a continuous manner;

an etalon being provided inside the cavity for changing [(expanding] the tuning range and for determining the output power of the laser, wherein the etalon is rotatable or swivelable about an axis of rotation which extends at right angles to the optical axis of the laser or at an inclination to the latter by a small angle.

10. (Once amended) [A diode pumped solid state laser] The arrangement according to claim 9, wherein the etalon is constructed as a transparent disk which is rotatable or swivelable about the axis of rotation and is angularly adjustable by an angular drive.

11. (Once amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein a stepper motor [, known per se,] at least one of whose coils is controllable by [means of] a controlling circuit, is provided as a drive device.

12. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein a piezo-actuator in operative connection with the etalon directly or with [the] an intermediary of additional elements is provided as drive device.

13. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein [the] a piezo-actuator comprises a bending element as a driving element.

14. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein only one coil of [the] a stepper motor is controlled in the angular drive.

15. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein both coils of [the] a stepper motor are controlled, and wherein [the] a field vector is modulated to prevent hystereses.

16. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein [the] a motor is operated in microstep operation.

17. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein the rotational axis of the etalon is arranged so as to be inclined at an angle δ of less than 10° in relation to [the] a vertical line to the optical axis of the laser.

18. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein a flexible element with good heat conductivity is provided for cooling [the] a moving element.

19. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein [the] a element with good heat conductivity is made of copper.

20. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein wedge-shaped crystals or other wedge-shaped optical elements are provided for preventing formation of parasitic etalons.

21. (Once Amended) [The diode pumped solid state laser] The arrangement according to claim 10, wherein a standing wave cavity is provided in such a way that a more secure single-frequency operation is achieved by means of suitable matching of the selectivity of the etalon with the suppression of side modes by spatial hole burning achieved by the arrangement and selection of thickness and doping of the laser crystal.

22. (Once Amended) [The diode pumped solid state laser] <u>The arrangement</u> according to claim 10, wherein the cavity length is less than 5 mm.

23. (Once Amended) [The diode pumped solid state laser] <u>The arrangement</u> according to claim 10, wherein a piezo-actuator with a stationary etalon is provided for tuning the laser, wherein the frequency step range FSB of the etalon is greater than the amplification bandwidth of the laser crystal and the fineness is selected in such a way that a secure single-frequency operation is ensured in the maximum tuning range.

24. (Once Amended) [The diode pumped solid state laser] <u>The arrangement</u> according to claim 10, wherein the etalon is moved jointly in order to achieve a larger tuning range.

25. (Once Amended) [The diode pumped solid state laser] <u>The arrangement</u> according to claim 10, wherein both coils of [the] <u>a</u> stepper motor are controlled, wherein the position of the etalon is modulated.

<u>PLEASE ADD THE FOLLOWING NEW CLAIM:</u>

26. (New) The method of claim 1 wherein:

the at least one optical element is an etalon.